

REMARKS

The Examiner's recognition of Applicants' invention by the allowance of claims 1, 19 and 20, and the indication of allowable subject matter for claims 2 and 12 is gratefully acknowledged.

Claim 1 is amended to more particularly point out that the thermal leads are interposed between the electrical leads, that the exterior ends of the electrical leads extend in a first direction, and that the exterior leads of the thermal leads extend in a generally opposite, second direction spaced apart from the housing, as shown in Figs. 3-7.

Claim Rejection based upon Roh

Claims 1, 4-5, 7-8, 11, and 16-17 were rejected under 35 U.S.C. § 102(b) as anticipated by United States Patent No. 5,644,164, issued to Roh in 1997.

Roh shows a semiconductor device that comprises electrical leads 30 for electrical connection, and heat conducting leads 60, col. 2, lines 22-23, 25-26, and 30-31. Referring to Figs. 2 and 3, the heat conducting leads 60 are disposed outboard from the electrical leads 30 and extend across the central region to extract to the ends of the package. Further, the ends of the heat conducting leads conform against the package to support the mass of a heat dissipation member 70 mounted onto the device, see Fig. 7 and col. 3, beginning at line 21. Thus, Roh designs heat conducting leads to draw heat away from the electrical connections to a heat sink supported on the device. In contrast, Applicants' package comprises thermal leads that are arranged and configured to promote convective heat dissipation. Accordingly, the thermal leads are interspersed with the electrical leads to provide more uniform heat transfer about the circuit device and feature distal ends that extend into space to promote convective heat transfer. Roh does not show these features and so cannot anticipate or even suggest Applicants' invention.

Claim 1 is directed to Applicants' electronic package that includes multiple electrical leads and a thermally-conductive support structure comprising multiple thermal leads. The thermal leads are interposed between electrical leads. Roh shows heat conducting leads located at the ends of the structure, outboard from the electrical leads. In accordance with the claim, the distal ends of the thermal leads are apart from the molded housing. Roh shows heat conducting leads against the housing to support the mass of the thermal dissipation member, i.e., heat sink. Thus, Roh does not teach or suggest Applicants' electronic package in claim 1.

Claims 4-5 and 7-8 are dependent upon claim 1 and so are not taught or suggested by Roh for the reasons set forth with regard to that claim, but recite additional features preferred in the practice of Applicants' invention.

Claim 11 is directed to Applicants' electronic packaging method that includes separating, from a conductive leadframe, first and second sets of leads, which, following the language of the claim, form the connector terminals and the thermal dissipaters, respectively. The first set of leads are interposed between the second set. In contrast, Roh configures heat conducting leads at the ends of the device apart from the electrical leads. In claim 11, the exterior ends of the second set of leads, i.e., the thermal dissipaters, are spaced apart from the housing. In Roh, the ends are against the housing for supporting the heat sink. Thus, Roh does not teach or suggest Applicants' method in claim 11, or claims 16 and 17 dependent thereon.

Accordingly, it is respectfully requested that the rejection of the claims based upon Roh be reconsidered and withdrawn, and that the claims be allowed.

Claim Rejection based upon Ichikawa et al.

Claims 1, , 3-5, 11, 13 and 16 were rejected under 35 U.S.C. § 102(b) as anticipated by United States Patent No. 6, 242, 797, issued to Ichikawa et al. in 2001.

Ichikawa et al. describes a integrated circuit device that lead terminals 5 that extend from opposite sides, and radiating plate 3 that has end portions 9 that extend out the ends of the resin member 8, see particularly Fig. 1b and col. 4, line 56, to col. 5, line 11. The ends of terminals 5 and end portions 9 are coplanar, to facilitate attachment to a planar substrate. Thus, the device in Ichikawa et al., like Roh above, is designed to conduct heat away out the sides apart from the electrical leads, and provides electrical and thermal leads in the same direction. In contrast, in Applicants' device, the electrical leads and the thermal leads extend in opposite directions, so that the electrical leads may be attached to a substrate, and the thermal leads may extend into space for convective heat transfer. Also, the thermal leads are interposed between the electrical leads, as opposed to being at the ends of the device. Ichikawa et al. does not show these features and so does not anticipate, or even suggest, Applicants' invention.

Claim 1 is directed to Applicants' electronic package. The claim calls for electrical leads that extend in a first direction and thermal leads that extend in a second, opposite direction. Ichikawa et al. has lead terminals and a radiating plate are bent towards the same plane, not in opposite directions. Also, the claim calls for the thermal leads to be interposed between the electrical leads, a feature lacking in Ichikawa et al. Thus, Ichikawa et al. does not teach or suggest Applicants' electronic package in claim 1, or in claims 3-5 dependent thereon.

Claim 11 is directed to Applicants' electronic packaging method and calls for interposing the first set of (electrical) leads and the second set of (thermal) leads. The radiating plate in Ichikawa et al. extends out different sides from the electrical connections. The claims further calls for bending the exterior ends of the first set of leads to extend in a first direction, and the exterior ends of the second set in an opposite direction. The ends in Ichikawa et al. are coplanar. Thus, Ichikawa et al. does not teach or suggest Applicants' method in claim 11, or dependent claims 13 and 16.

Therefore, it is respectfully requested that the rejection of the claims based upon Ichikawa et al. be reconsidered and withdrawn, and that the claims be allowed.

Claim Rejection based upon James

Claims 11, 13, 14 and 16-17 were rejected under 35 U.S.C. § 102(a) as anticipated by United States Patent No. 6,396,133, issued to James in 2002.

James shows a semiconductor device assembly 48 in Fig. 4 that includes lead terminals 13 that are adapted for electrical connections, and a heat dissipating lead frame 22. The lead terminals and heat dissipating frame extend out opposite sides of the assembly. In contrast, in Applicants' package, the electrical leads and thermal leads extend out the same side and are interspersed and bent in opposite directions. Nothing in James shows the heat dissipating frame interposed between electrical connections, or bent in a different direction. Thus, James does not teach or suggest Applicants' invention.

Claim 11 is directed to Applicants' electronic packaging method and calls for interposing the first set of (electrical) leads and the second set of (thermal) leads. James shows lead terminals and a heat dissipating frame out opposite sides, and so not interposed. The claims further calls for bending the exterior ends of the first set of leads to extend in a first direction, and the exterior ends of the second set in an opposite direction. The ends in James are bent in the same direction, see Fig. 5A. Thus, Ichikawa et al. does not teach or suggest Applicants' method in claim 11, or dependent claims 13, 14 and 16-17.

Therefore, it is respectfully requested that the rejection of the claims based upon James be reconsidered and withdrawn, and that the claims be allowed.

Claim Rejection based upon Lee et al.

Claims 1, 9, 11 and 18 were rejected under 35 U.S.C. § 102(a) as anticipated by United States Patent Application Publication No. 2004/0000703, by Lee et al. and published in 2004.

Applicants contend that Lee et al. is not a proper reference under Section 102(a) since it was not published until after the filing date of the present application, and request that the reference be withdrawn.

Even if considered, Lee et al. does not show electrical leads with thermal leads interposed therebetween, or projecting from the molded housing and bent in opposite directions. Lee et al. discloses a package that includes electrical leads 38 and base pad 34, in which the base pad is described to provide heat dissipation. In Figs. 2B, 2C, 3B and 3C, the base pad is level with the package body, see paragraph 0026, whereas in the embodiment in Figs. 2D and 3D, the base pad is encapsulated within the package body, see paragraph 0028. Nothing in Lee et al. shows a thermal lead that protrudes from the housing and is bent opposite the electrical leads, so as to provide convective heat transfer, a key feature of the present invention. Moreover, the base pad 34 in Lee et al. is disposed in a plane underlying the electrical leads, and is not interspersed therebetween. Thus, Lee et al. does not teach or even suggest Applicants' invention.

Claim 1 calls for an electronic package wherein the thermal leads protrude from the molded housing, are interposed between electrical leads and extend in an opposite direction from the electrical leads. The base pad in lee et al. does not protrude, located apart from the electrical leads, and is not bent opposite the electrical leads. Thus, Lee et al. does not show the electronic package in claim 1, or dependent claim 9.

For the same reasons, Lee et al. does not show the electronic packaging method in claims 11 or 18.

Therefore, it is respectfully requested that the rejection of the claims based upon Lee et al. be reconsidered and withdrawn, and that the claims be allowed.

Conclusion

It is believed, in view of the amendments and remarks herein, that all grounds of rejection of the claims have been addressed and overcome, and that all claims are in condition for allowance. If it would further prosecution of the application, the Examiner is urged to contact the undersigned at the phone number provided.

The Commissioner is hereby authorized to charge any fees associated with this communication to Deposit Account No. 50-0831.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Douglas D. Fekete", is written over a horizontal line.

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